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POULTRY MANAGEMENT

See revised
edition



THIS BULLETIN gives concise information regarding the more important phases of chicken raising. The reader who wishes to go more fully into the subject or who desires information about other kinds of poultry or other phases of the poultry industry is referred to the list of publications on the last page.

Contribution from the Bureau of Animal Industry
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POULTRY MANAGEMENT.

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NOTE.—Mr. Bell resigned from the department October 15, 1920.

MAKING A START WITH POULTRY.

FIRST ATTEMPTS at poultry raising should begin in a small way with a few fowls, and before large investments are made the business should be learned thoroughly. Mistakes will be made and many difficult problems will be presented for solution before any large measure of success will be attained. As soon as the enterprise is found to be profitable, more capital may be put into the plant.

A good plan for one who wishes to learn the art of poultry keeping is to obtain a position with some successful poultryman. One or two years of work on a large, practical plant will be a great help, as the methods of caring for the birds and of marketing the products can thus be learned better than in almost any other way.

The question is often asked, What is the best time of the year to begin? When to begin is not very important, but the fall is a good time, for then stock can be purchased for less money than at any other season. It is also advisable that the fowls be moved to their new quarters before they begin to lay.

A start can be made also by purchasing eggs for hatching, or day-old chicks. The investment is very small, but there is more chance of not getting results with eggs or day-old chicks than there is with mature stock.

CLASSIFICATION OF BREEDS.

For convenience chickens may be classified as egg breeds, meat breeds, general-purpose breeds, and fancy or ornamental breeds.

EGG BREEDS.

The egg breeds include the small or medium-sized fowls very active, quick to mature, producers of white-shelled eggs, usually nonsitters or at best but poor sitters, and rather poor mothers. The

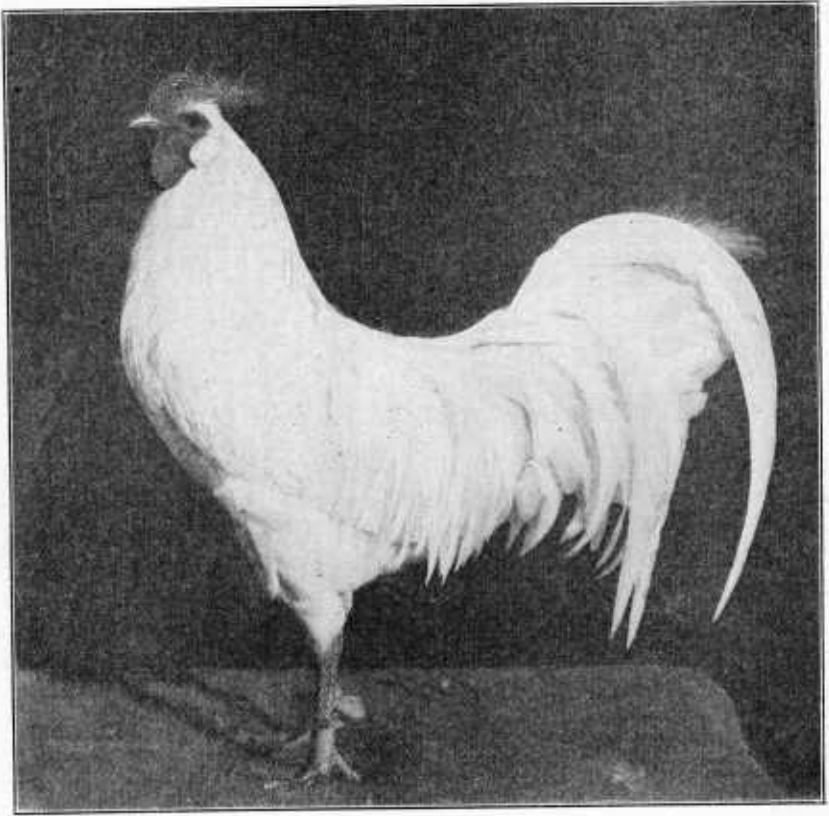


FIG. 1.—Single-Comb White Leghorn. One of the most popular egg breeds.

various varieties of Leghorns, Anconas, and Minorcas are good representatives of this class. Because they are poor sitters some other breed, or at least a few other fowls, should be kept if natural methods of incubation are to be used. On account of their early maturity it is not uncommon for individuals to begin laying at the age of $4\frac{1}{2}$ months. These very active breeds do not fatten so readily under ordinary conditions as the larger and less active breeds. The fowls of this class have large combs and wattles, which make them rather sensitive to low temperatures.

MEAT BREEDS.

The largest fowls are represented in meat breeds, which are especially suitable for the production of large roasters. Fowls of this class are slow and somewhat sluggish in movement, with little desire for foraging, easily confined by low fences, rather slow to mature, persistent sitters, and rather indifferent layers of large brown-shelled eggs. The Brahmas, Cochins, and Langshans may be mentioned as belonging to this class.

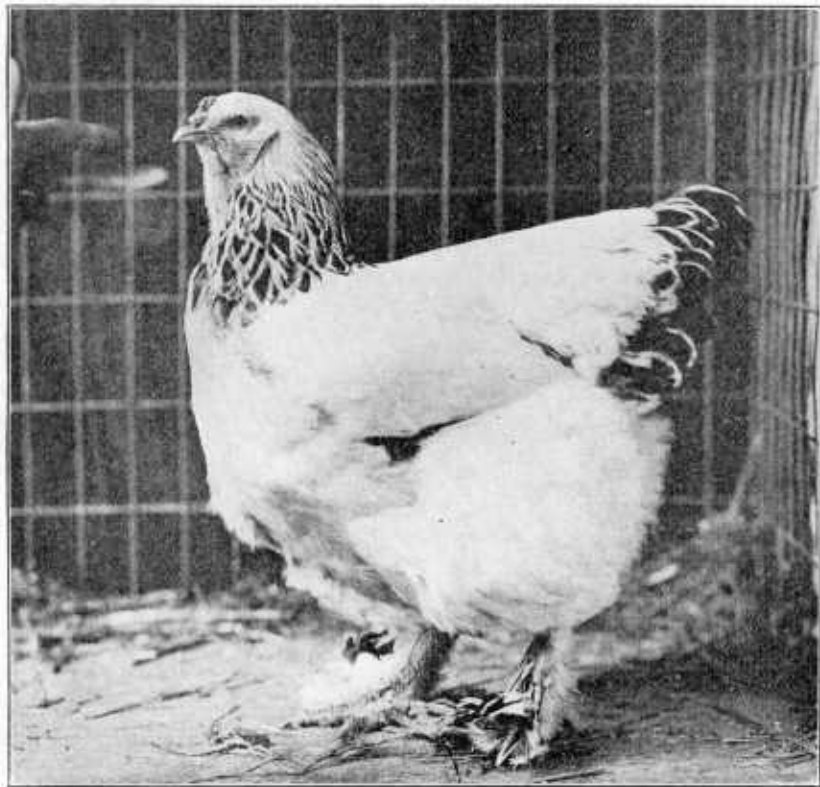


FIG. 2.—The Light Brahma. A large fowl of the meat type.

GENERAL-PURPOSE BREEDS.

The general-purpose breeds include fowls of fair size that produce a good quantity of brown-shelled eggs, making them especially adapted to the person wishing a supply of both eggs and meat. If one has to make frequent sales of flesh in the shape of surplus cockerels and hens, the carcass as well as egg production should be considered. The general-purpose breeds are usually good sitters and good mothers. They have medium-sized combs and wattles and endure cold weather well. They occupy a medium position between the

egg and meat breeds as to size, egg production, and docility. The Plymouth Rocks, Wyandottes, Rhode Island Reds, and Orpingtons are good representatives of this class.

ORNAMENTAL BREEDS.

As a rule the ornamental breeds are not so well adapted for farm purposes as are the breeds of the other three classes. The Polish,

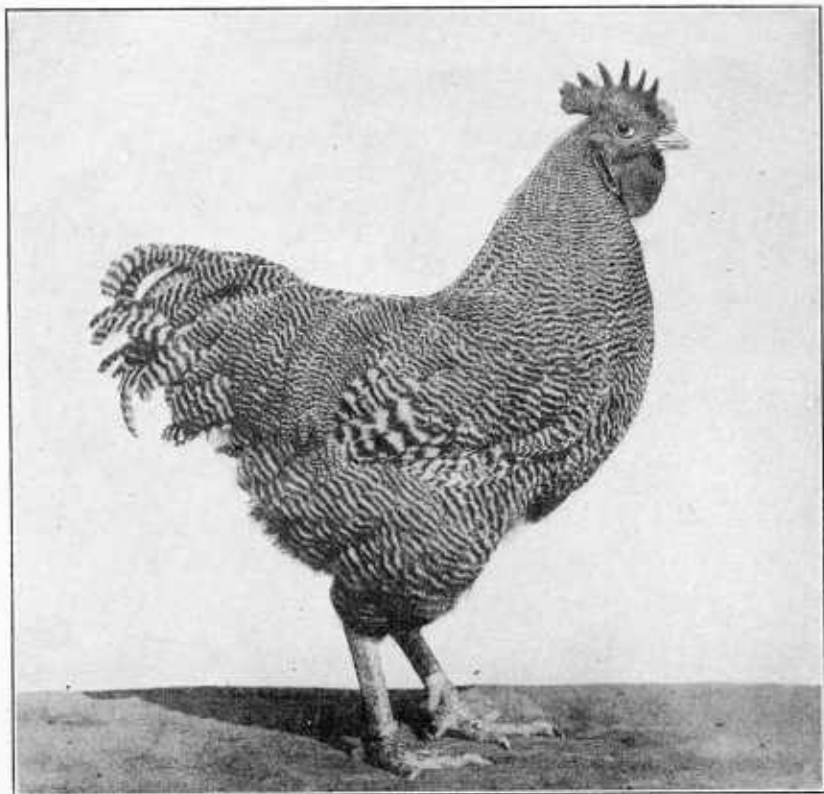


FIG. 3.—The Barred Plymouth Rock. A good representative of the general-purpose breeds.

Exhibition Games, Silkies, Sultans, Frizzles, and Bantams are representative ornamental breeds.

HOUSES AND INCLOSURES.

SYSTEMS OF HOUSING.

In housing fowls there are two systems widely different in their extremes. At one extreme is the colony plan, shown in figure 4, which consists in placing small houses for small flocks far enough apart to obviate the necessity of fences, thus giving free range with but little mingling of the different flocks. At the other extreme is

the continuous-apartment house shown in figure 5. This kind of house consists of a series of separate pens, under one roof, opening directly into a hallway in the rear, or having doors between the pens without the hallway, or opening into a hallway and also into one another. There are several plans and arrangements between these two extremes which may be built to suit varying conditions.

The advantages of the colony plan are, (1) small flocks on free range; (2) no expense for fencing; (3) less need for scrupulous attention to cleanliness and providing regular supplies of animal and vegetable feed during summer months. This plan, however, has the following disadvantages: (1) Extra cost of labor in caring for fowls in stormy weather, when it is often difficult to get around

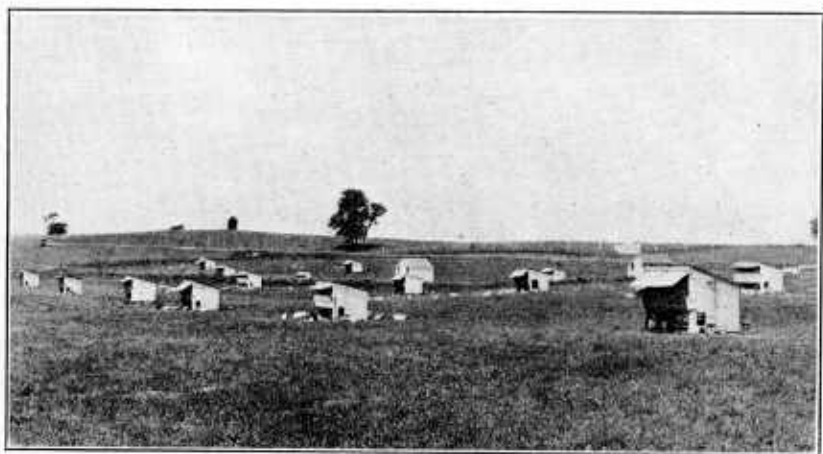


FIG. 4.—Colony houses and free range.

to feed and care for the fowls regularly; (2) houses built on the colony plan, if built as well, cost more than a continuous house of the same capacity, since partitions, which may be constructed largely of wire netting, are much cheaper than two end walls; (3) the colony plan allows but about 100 birds per acre, while the continuous-house system, with suitable yards, allows 450 to 500 birds per acre.

Continuous house.—In figure 5 is shown a long, continuous house, 20 feet deep and divided into pens 20 feet square. Each pen therefore contains 324 square feet or room enough to accommodate about 100 fowls. A curtain is hung over each opening and should be dropped on cold nights. This house can be built any length desired, by adding additional pens, to accommodate any number of fowls.

Colony house.—In figure 6 is shown a single colony house which is 10 feet long and 7 feet deep and will accommodate 25 hens if they have free range. This house is built on runners which are made

from 4 by 6 inch timbers and is well adapted for the farmer who wishes to keep a few small flocks and to move them to different parts of the farm.

LOCATION AND CONSTRUCTION OF HOUSES.

Location of buildings.—The first consideration is a suitable location for the poultry house or houses. If possible it is best to select an elevation having a natural drainage away from the building, for damp ground means cold ground. If the house can be built in

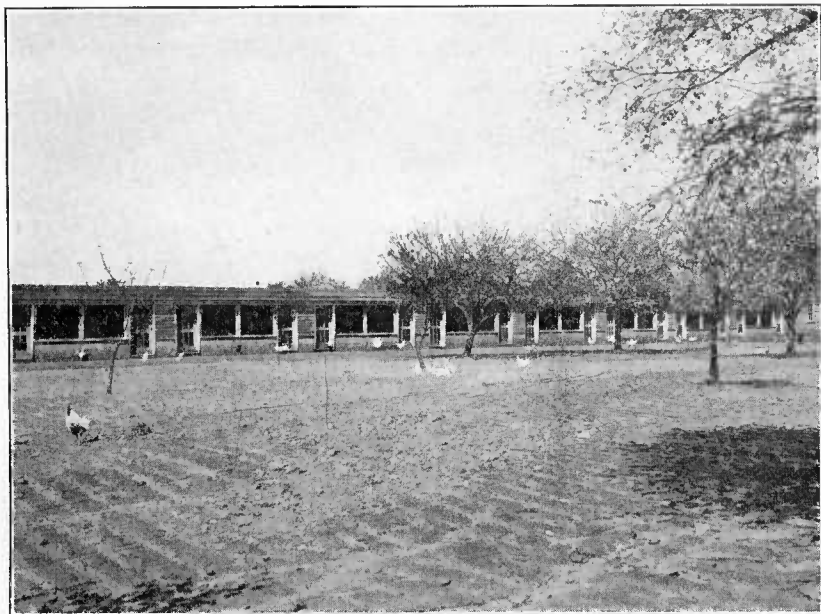


FIG. 5.—Continuous-apartment poultry house.

the lee of a windbreak or a hill, or in front of farm buildings, so much the better. A dry, porous soil, such as sandy or gravelly loam, is preferable to a clay soil, for the former is more easily kept in a sanitary condition. If it is impracticable to select a soil that is naturally dry, it may pay to make the soil dry by thorough under-drainage.

As sunlight and warmth are essential to success, the buildings should face the south because, other things being equal, such buildings are warmer and drier. A gentle slope facing the south is the most suitable. When a direct southern exposure can not be obtained a southeastern is preferable to a southwestern exposure, for fowls seem to prefer morning to afternoon sun.

When to build.—It is best to build the houses during the spring or early summer, for then they have time to dry out during the hot

days. Lumber is often rather damp and should be thoroughly dried before winter. Cement floors and foundation walls will also have an opportunity to dry thoroughly, and thus much of the dampness so often attributed to them may be avoided.

Size and dimensions of house.—The size of the building required will depend largely on the number of fowls to be kept and on the size of the flocks. With flocks of from 40 to 50 about 4 square feet of floor space to each bird will suffice in most cases when careful attention is given to cleanliness and ventilation. If the fowls are kept in

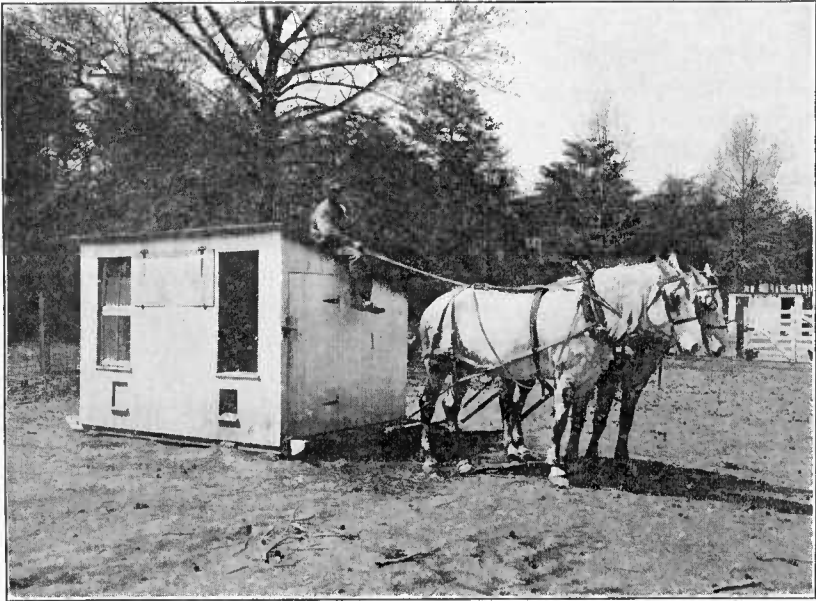


FIG. 6.—Moving a colony house to a new location.

smaller flocks, more floor space per bird will be needed. Where the climate is so mild that it is unnecessary to keep the fowls confined except for a few days at a time, less space per bird is sufficient. The smaller breeds, being more active and restless, require about as much room as the larger breeds.

For the greatest amount of floor space for the least cost, a building should be square, as, other things being equal, the nearer square a house is the less lumber it will take to the square foot of floor surface. It is, however, out of the question to have a large house built square.

The building should not be so wide that the sun can not reach the back of the house; otherwise it will be damp. Fourteen to twenty feet is a convenient width if there are no alleyways.

The house should be built as low as possible without danger of the

attendants' bumping their heads against the ceiling. A low house is more easily warmed than a high one.

Foundation walls.—When permanent houses are to be built it is usually most economical to erect them on foundations made of brick, stone, or concrete. These should be built deep enough to prevent heaving by frost and high enough to prevent surface water from entering. If large stones or bricks are not readily available, good walls may be made from small stones. In case none of these foundation materials are available, the building may be erected on posts.

The roof.—There are three general styles of roofs, the single pitch, the double pitch with equal sides or gable roof, and the combination with one long and one short pitch.

The single-pitch roof is the easiest to build. It gives the highest vertical front exposed to the sun's rays and throws all the rain water to the rear; but in order to have the back wall of sufficient height to allow a person to work conveniently in the rear portion of the house it is necessary to have the front wall very high, unless a very slight pitch is used, which requires much more lumber for the front side than in the case of the other two styles. The gable roof provides for a garret space, which may be filled with straw, thus helping to make the house warm and dry.

It takes the same quantity of material to build any one of the roofs mentioned if the pitch of the roof and the ground plan are similar. Most roofs can be one-fourth pitch. Shingle roofs, however, should generally be one-third pitch. In any case, the steeper the pitch the greater will be the cost of roofing and the longer the roof will last.

There are several prepared roofing materials which are good, or the roof may be shingled.

Floors.—The floor may be of earth, wood, or cement. It is important that the floor be dry; otherwise it will be impossible to keep litter on the floor fit for use. Straw and similar material gathers moisture, and when the litter becomes damp enough to be limp it is practically useless for fowls to scratch in for their grain feed.

Earth floors are excellent, provided they are kept dry. Except in very dry climates, however, they are apt to be damp. Where an earth floor is used it should be 3 or 4 inches above the level of the ground outside. An objection to earth floors is the difficulty of cleaning them, for it is usually necessary to remove 2 or 3 inches of the top and to replace this with fresh soil, and even then one can not be certain that all the droppings have been removed.

Board floors are usually short-lived unless air is allowed to circulate under them. This may be provided for by means of openings in the foundation walls, which, however, should be closed during the winter months. A board floor covered with one-fourth inch of fine

sand, with scratching material on top of that, makes a good floor. The litter and sand can be removed readily when desired and fresh materials provided. If the wooden floors are constructed within 2 or 3 inches of the ground, it is essential that the foundation walls be constructed in such way that rats can not gain access beneath the floor.

A good cement floor is the best, for it is easily cleaned and very durable. It should be covered with one-fourth or one-half inch of fine soil or sand and plenty of litter. In constructing this floor the ground should be excavated to the depth of 3 or 4 inches and then filled in with small stones or coarse gravel to make a good foundation. Cover with about 2 inches of mortar, made by mixing thoroughly while dry 1 part of good cement to 3 or 4 parts of sand and then wetting with water and again mixing thoroughly.

Windows.—Too much glass makes a house cold at night and during the winter months and hot during the summer days. One square foot of glass surface should be allowed to about 16 or 18 square feet of floor space. The windows should be placed high and vertical rather than horizontal, for if they are placed low the sunlight will not reach the rear portions of the floor space, except during the winter, when the sun is lowest. An 8 by 10 inch glass is a good-sized light used in a 12-light sash, making the sash about 3 feet 10 inches by 2 feet 5 inches. A 10 by 12 inch glass is another good-sized light to be used in an 8-light sash, making the sash about 4 feet 5 inches by 2 feet. Use two of these sashes for a house having about 250 square feet of floor space.

Quality of construction.—It is not necessary to build an expensive house, but it should be serviceable, fairly roomy, well lighted, and well ventilated without drafts. The house should be built with a view to simplicity, economy, and convenience and should be constructed according to the location and climatic conditions.

The walls may consist of (1) one thickness of boards, matched or unmatched; (2) one thickness of boards, matched or unmatched, covered with one thickness of building paper or roofing; (3) one thickness of boards covered with paper, then shingled or covered with lapped siding or matched lumber, making a solid double wall.

INTERIOR ARRANGEMENTS.

So far as possible, interior fixtures should be so constructed as to permit them to be readily removed and cleaned.

Roosts.—A 2 by 3 inch scantling set edgewise, with the upper edge slightly rounded, makes a satisfactory roost. Allow 7 to 10 inches for each fowl; that is, a roost 16 feet long would furnish room enough for 20 fowls. A smooth platform should be placed under the roosts to catch the droppings. The roosts should be from 6

to 10 inches above this platform so as to allow the droppings to be removed without removing the roosts. It is usually desirable to have the platform some distance from the floor, from 2 to 3 feet, in order that all the floor space may be available.

Nests.—The nests should be situated in a poorly lighted place, for then the hens will be less apt to eat the eggs. A good place is directly beneath the roost platform, with the nests so arranged that the hen enters from the side toward the wall. Each nest should be from 12 to 14 inches square, and high enough (about 12 or 14 inches) to be convenient for the hen to enter. The partitions between the nests should be high enough to prevent the hens from rolling the eggs

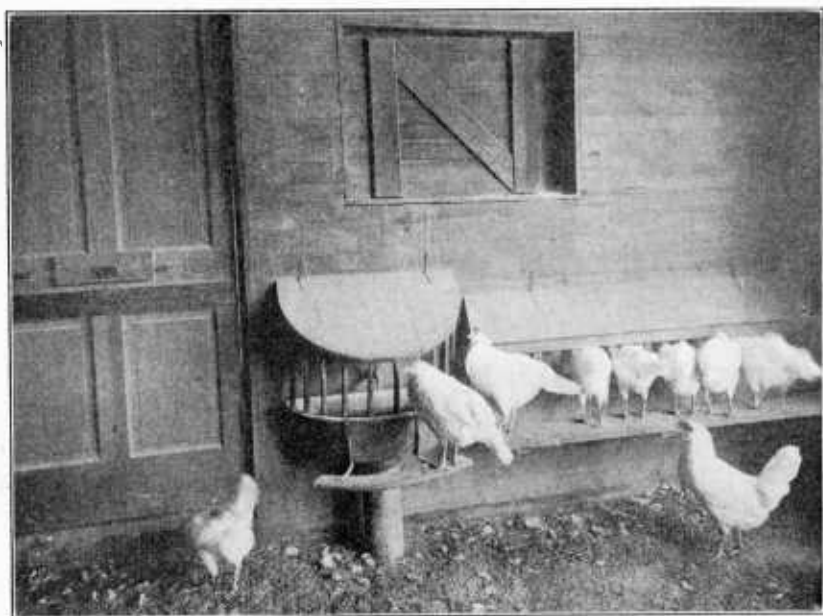


FIG. 7.—Interior of laying house, showing feed hopper and drinking fountain.

from one nest to another, and low enough to permit hens to go from one nest to another; otherwise the hens may fight and eggs will be broken. Fine hay or straw makes good nesting material.

Dust boxes.—Chickens never wash, as many other birds do, but cleanse themselves by wallowing in soil; therefore, some means for dusting should be provided. For a flock of 50 to 60 fowls a dust box 3 by 5 feet or 4 by 4 feet will be large enough in most instances, and should be placed where it can be reached by sunlight during as much of the day as possible. Fine, light, dry dust is the best, but sandy loam is good. Road dust is recommended by many, but it is apt to be filthy. Coal or wood ashes may be mixed with the soil if desired.

Drinking fountain.—The water receptacle should be large enough to hold sufficient water to last 24 hours, that the fowls may never suffer for the lack of water, and should be elevated a little above the floor to prevent the water from becoming dirty. Drinking vessels should be well rinsed daily before fresh water is given.

Feed hopper and grit boxes.—In figure 8 is shown an easily and cheaply made feed hopper, so constructed that the fowls can not waste the mash.

Several small boxes for shell, grit, beef scraps, etc., should be fastened against the wall at a convenient distance (12 to 16 inches) above the floor where the fowls can have constant access to them.

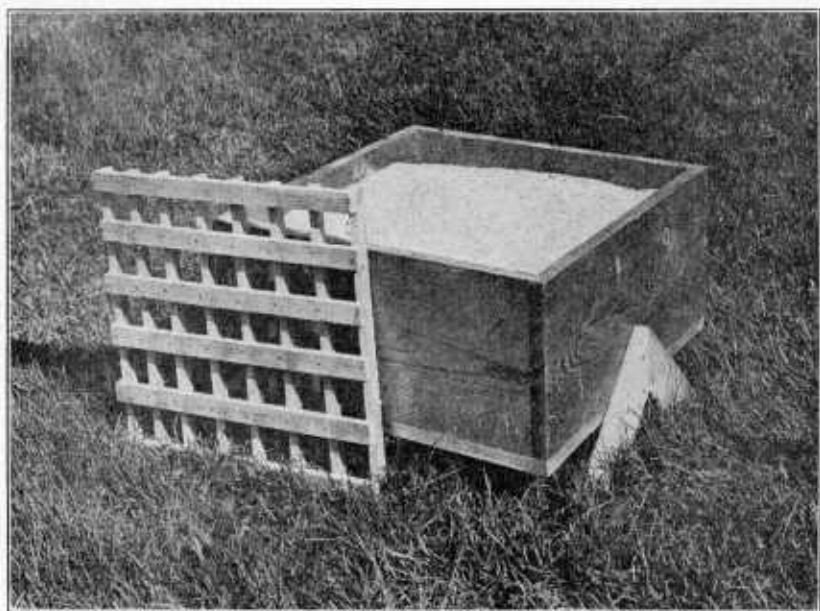


FIG. 8.—Simple box dry-mash hopper for indoor use.

Ventilation.—As it is better to have a cold, dry house than a warm, damp one, some means of ventilation should be provided. A simple and practicable method is by opening doors and windows as much or little as weather conditions require, but in all cases care should be taken to avoid drafts. A cloth curtain over an opening is a very satisfactory method of ventilation.

YARDS.

It is well to have double yards, for then one may rotate green crops. The yards may be sown to rye, oats, barley, wheat, or any quick-growing grain crop, and while the fowls are using one yard the green feed in the other is getting a fresh start.

If the yards can be on only one side of the house it should be the south side in order that the fowls may have the benefit of the first dry ground in early spring. Not infrequently it happens that in localities where snow is abundant, the ground on the south side is dry many days before that on the north side.

If the yards are to be in permanent sod and are to furnish green feed for the fowls, 70 to 80 square feet should be allowed for each bird. If part of the green feed is to be otherwise provided for, and the yards used mainly for exercise grounds, 35 to 40 square feet per bird will be sufficient.

Wire netting, 2-inch mesh, is suitable for fencing. Where several runs are adjoining, the fences may be made of fine-meshed wire at the bottom to a height of 2 to 2½ feet to prevent the males from fighting with one another. The height of the fences will need to be regulated by the variety of fowls. The heaviest breeds, like the Brahmas, may be restrained by a 4-foot fence. Most of the other breeds can be kept in by a 6-foot fence. Some of the Hamburgs and Leghorns, however, need a 7-foot fence. One wing of each bird may be clipped to prevent flying over this fence. Gates should be provided between yards.

Shade is needed, and this may be advantageously furnished by planting fruit trees, such as pear, plum, cherry, and apple, in the yard.

MANAGEMENT OF HENS FOR EGG PRODUCTION.

The problem of feeding is of great importance, for on it depends to a large extent not only the general health of the birds but also the economy which promotes success. It is a subject, however, which should be studied with a large amount of common sense, for there are no hard and fast rules which can be laid down as applying to every case. The prices of feeds and the general environment should be considered in determining the right rations.

For the largest profit a good proportion of the eggs should be laid during the winter. If two extra eggs a week can be obtained from each hen, a good profit will be made, and if the product is increased by only one egg a week in winter this one egg will pay for all the feed the hen eats. To obtain this greater production not only should the fowls be young and of a good laying breed but the feeder should have a full knowledge of the proper feed and its preparation.

The nutriment in the feed of laying hens serves a twofold purpose—(1) to repair waste and furnish heat to the body, and (2) to supply the egg-making materials. As only the surplus over what is needed for the body is available for egg production, the proper feeds should be fed in sufficient quantities to induce this production.

In feeding poultry a valuable lesson may be learned from nature. In the spring the production of eggs on the farm is an easy matter.

Fowls which are at liberty to roam find on their range an abundance of green and animal feed, which, with grain, furnishes a perfect ration for laying hens. In addition they get plenty of exercise and fresh air. So far as lies within his power, then, the feeder should aim to make the winter conditions like those of the spring.

GRAIN FEEDS.

The principal grains fed to poultry are corn, wheat, oats, and barley. Corn and wheat are the most popular and both are well relished by fowls. These two grains, however, are too fattening to constitute the sole feed for laying hens and should be supplemented with feeds high in protein, such as wheat bran, wheat middlings, gluten meal, linseed-oil meal, cottonseed meal, and meat scrap. When corn is fed to laying hens that have opportunity to take plenty of exercise and to procure insects and green feed, much more satisfactory results are likely to be obtained than when it is fed to the same fowls closely confined. Corn is the best and most economical poultry grain, but should always be used with some other grain. It may be fed quite largely in the cold climates during winter, but should be fed sparingly during summer.

Wheat is generally considered the safest grain to be fed alone. It is not quite so fattening as corn, still it is too fattening when fed alone. Wheat contains more protein than corn, about the same amount of carbohydrates, but less fat, and on the whole is considered as not so valuable for fattening but better for growth. Wheat screenings, if they are of a good grade, can frequently be purchased and fed to advantage. Of course there is always the danger of introducing weed seed on the farm by using wheat screenings.

MASH FEEDING.

It is the practice of all successful poultrymen to feed a part of the daily grain ration ground. A fowl's gizzard is capable of grinding all kinds of grain, but it is generally considered to be more economical to have a part of the grinding done by other power. The soft-feed idea, however, must not be overworked. A beginner often reasons that it is cheaper for the miller than for the fowl to grind the grain; but the powerful muscles of the gizzard are there to be used, and experience has shown that the balance of power of functions in the fowl's economy makes the vigorous exercise of the gizzard beneficial. When feeding moistened ground feed use a comparatively dry, crumbly mash, and not a thin slop. Give as much as the fowls will eat readily in 15 or 20 minutes.

The more common practice of feeding the mash at the present time is to feed it in a dry form by keeping it in hoppers where the fowls may have constant access to it. The advantages from feeding

a dry instead of a moistened mash are the saving of labor and the lessened danger of bowel trouble resulting from sloppy or soured mashes.

RATIONS.

The following are suggested rations from which the reader may select one which is best adapted to local conditions and prices. Any changes in the feed should be made gradually, for sudden changes may decrease egg production materially.

Ration No. 1.

Mash.	Scratch mixture.
100 pounds corn meal.	50 pounds cracked corn.
40 pounds meat scrap.	50 pounds wheat.
6 pounds wheat bran.	50 pounds oats.
6 pounds wheat middlings.	

Ration No. 2.

100 pounds corn meal.	100 pounds cracked corn.
35 pounds meat scrap.	50 pounds oats.

Ration No. 3.

100 pounds corn or barley meal.	100 pounds cracked corn.
50 pounds wheat bran.	50 pounds oats.
50 pounds wheat middlings.	50 pounds wheat or barley.
50 pounds meat or fish scrap.	

Ration No. 4.

100 pounds corn meal.	100 pounds cracked corn.
50 pounds middlings.	50 pounds wheat.
50 pounds bran.	50 pounds oats.
20 pounds cottonseed or gluten meal.	50 pounds barley.
20 pounds meat scrap.	

Ration No. 5.

50 pounds corn meal.	100 pounds cracked corn.
50 pounds bran.	50 pounds wheat.
35 pounds meat scrap.	50 pounds oats.
50 pounds middlings.	50 pounds barley.
50 pounds ground oats.	

Ration No. 6.

100 pounds corn meal.	100 pounds cracked corn.
25 pounds bran.	50 pounds wheat.
35 pounds middlings.	50 pounds oats.
20 pounds meat scrap.	

MISCELLANEOUS FEEDS.

Animal feed.—Chickens eat a large amount of animal matter in the form of insects, worms, and other low forms of life when allowed to range at will. If the poultry keeper is to get the best results from his fowls in winter he must furnish a substitute for this class of feed. For this purpose green cut bone, meat scraps, animal meal, fish meal,

or tankage may be used. Green cut bone is usually fed by itself, and the scraps and meal may be readily mixed with the mash. Cut bone consists of green or fresh bone sliced or shaved into thin pieces by a bone cutter. Where a good supply of fresh bone can be obtained regularly it is very useful, but it can not be kept sweet for such long periods as the beef scraps and animal meal. Green cut bone should be fed carefully and kept in a sweet condition; otherwise bowel trouble may result. One pound a day is sufficient for 20 hens, but not over one-half pound should be fed to that number when first beginning to feed it. Any form of meat is likely at first to loosen the bowels of the hens, and the hens should be watched carefully and not fed too much. After the fowls have been accustomed to animal meal or meat scraps it may be kept constantly before them in the mash.

Green feed.—If the best results are to be obtained with poultry they must be furnished with a plentiful supply of green feed. Where fowls have unlimited range on a farm they will get green feed during most of the year, but during the winter it must be supplied for them. The question of how to supply the best feed at the least cost is one that each poultry keeper must decide largely for himself. It will probably make but little difference what kind of green feed is supplied provided it is relished by the fowls. Cabbages, turnips, beets, potatoes, and carrots are suitable for this purpose. The larger roots and the cabbages may be suspended by means of a wire or string, or they may be placed on the floor, in which case it would be well to split the turnips or beets lengthwise with a large knife. Potatoes and turnips should be fed cooked. The mangel is an excellent root for feeding raw. Cut clover soaked in boiling water and fed either alone or with the mash is good. Clover meal and ground alfalfa make fairly good green feeds. Where the fowls are yarded and not enough green feed is furnished by the yards, a small patch of clover, alfalfa, or rape may be sown. Any one of these, if frequently mowed, will furnish a great quantity of green feed in a form which is relished by the fowls. Canada field peas may also be sown for this purpose, and when fed in a tender, crisp condition are eaten readily. Rye is a good crop for late fall and early spring, as it will germinate and grow in very cold weather and will live through the winter. As a general thing, fowls should have once a day about all the green feed they will eat.

Sprouted oats constitute a popular form of green feed which is greatly relished by poultry, but which requires considerable care in preparation. Oats for sprouting are soaked overnight in warm water and then spread out one-half to 1 inch thick on trays having perforated bottoms and put into an oat sprouter. The oats should be thoroughly watered and the trays turned around daily to promote

even sprouting. In cool weather artificial heat should be supplied by the use of a kerosene lamp or by other means. Allow a square inch of sprouted oat surface per hen daily, feeding the sprouted oats on the floor of the poultry house or in the yard. Feed at any time after the sprouts are well started, which usually takes from 5 to 7 days.

Hay.—Clover hay is an economical feed for laying hens and may be prepared as follows: Cut the hay into as short lengths as possible (not more than one-fourth to one-half inch) and place in a bucket. Then pour boiling water over it and allow to stand for 2 or 3 hours or overnight. When ready to feed, drain off the water and mix the hay with the mash. The hay may constitute about one-half the bulk of the feed, although the exact proportion is immaterial. Clover hay is best, but any kind is valuable. The feeder must be careful not to give too much bulky feed, for the hen, having a small crop, can not make use of a large amount.

Water.—Plenty of fresh water should always be accessible to the hens. If supplied irregularly they are likely to drink too much at a time. It should not be exposed to the sun's rays in summer nor, if avoidable, be allowed to freeze in winter. In very frosty weather it is often worth while to give them two or three times a day water slightly warmed, rather than permit them to drink water at the freezing point. A flock of 50 hens in good laying condition will require from 4 to 6 quarts of water a day.

Milk.—When properly fed, milk makes an excellent feed for poultry. In feeding sour milk or buttermilk, however, the feeder must use care not to give too much, or bowel trouble will likely result. Skim milk is an economical feed. In skimming, the most valuable food constituents—the nitrogenous substances—are left in the skim milk. Not only does this skim milk contain much nutritive material, but it contains it in a form which, as a rule, is easily digested. Skim milk may often be advantageously substituted, in part, for meat. Milk may be used in mixing the soft feed, or it may be given the fowls to drink in addition to water.

GRIT AND OTHER SUBSTANCES.

Grit.—Grit is essential to the health of fowls and also to economy in feeding. Grit takes the place of teeth in preparing the feed for further digestion and is required for the proper preparation of feed in the gizzard. When the feed is not properly taken care of in this organ an undue strain is thrown on the fowl's system, often resulting in disease, and also allowing much of the nutriment to pass through the bird's body without being absorbed. In every pen or yard a box of grit should be kept.

Lime.—Ordinarily a hen does not consume lime enough to form the shells of eggs if she is laying abundantly unless something

besides the ordinary grain feeds is accessible. Oyster shells are very good for this purpose. A box of crushed shells may be kept before the fowls, allowing them to eat at will. Old mortar and fine gravel are also useful in supplying lime.

Charcoal.—Charcoal has a great absorptive power for gases, impurities, and acids, and thus acts as a corrective when the stomach is sour and digestion has been impaired.

METHODS OF FEEDING.

Fowls should have empty crops in the morning, and the crops should never be quite full until it is time to go to roost at night. For the first feed, grain scattered in the litter early in the morning is preferred, the sooner the better after the birds leave the roosts. This induces them to exercise, which is especially important on cold, winter mornings. About one-third of the scratch mixture should be fed in the morning and the other two-thirds in the afternoon.

Frequency of feeding.—Some poultrymen feed their flocks twice a day, while others feed them three times a day. The best plan is to feed fowls in confinement three times a day and those having free range in summer twice a day. When there is a very long interval between feeds it is difficult to keep fowls which are kept in confinement busy. Idle fowls often contract bad habits, such as feather pulling and egg eating; besides, they go out of condition from lack of exercise.

In case it is not convenient to feed three times a day, the moistened mash may be fed in the morning, and at the same time the noon feed of grain may be scattered in the litter; this will keep the fowls busy a great part of the day.

For those who can not conveniently feed their fowls early in the morning a good plan is to scatter grain in the litter after the birds have gone to roost. This grain will furnish feed for the early morning.

Some poultry keepers can look after their fowls only once a day. If this is in the morning, moistened mash may be fed, followed by throwing grain into the litter to furnish feed for the remainder of the day. If it is in the evening, before dark, a moistened mash may be given, and after the fowls go to roost grain may be scattered plentifully in the litter for eating during the next day.

Amount of feed.—It is impossible to state any exact quantity of feed that should be given to each fowl per day, as the appetites of the birds vary according to the conditions under which they are kept, the season of the year, and the kind of fowl, some being much greater eaters than others. A fair general estimate of how much to feed is about a quart of the scratch mixture and an equal weight of mash (about $1\frac{1}{2}$ quarts) daily to 12 or 13 hens of the general-purpose

breeds or to 15 or 16 hens of the smaller or egg breeds. The general rule is to keep the birds slightly hungry during the day, not giving all they will eat until just before roosting time. The birds should be handled now and then when they are on the perch, and if they are either too fleshy or too poor their rations should be modified.

Importance of a varied ration.—In feeding grain the aim of the feeder should be to give a variety. No one kind of grain alone is best. Variety may be obtained by mixing the grains or by feeding the different kinds of grain on different days. This variety is in accordance with nature. When on free range the fowls obtain a little of several kinds of feed. Grain should not be made the sole feed, for then fat and not eggs will be the usual result.

Effect of feed on character of egg.—In extreme cases the flavor and the odor of the feed have been imparted to the egg. Onions have been fed in sufficient quantity to bring about this effect. Feeds of high and objectionable flavor should not be fed by those who desire to produce a first-class article. In no case should tainted feed be allowed to enter into the ration. Feed also has an influence on the color of the yolk. Corn fed exclusively will give a deep yellow or highly colored yolk, while wheat fed alone will produce a much lighter-colored yolk. A fairly high-colored yolk can generally be obtained by feeding a moderate amount of corn. Plenty of green feed also enriches the color of the yolk.

THE DROPPINGS AS AN INDICATION OF HEALTH.

The condition of the droppings furnishes a good indication of the hen's health. They should be of sufficient consistency to hold their shape, but should not be too solid. In color they should be dark, tapering off into grayish white. Droppings that are soft or pasty and of a yellowish or brownish color indicate too much carbohydrates or a lack of meat. If, on the other hand, the droppings are watery and dark with red splashes of mucus in them too much meat is indicated. A greenish, watery diarrhea usually indicates insanitary conditions, either in the surroundings, the feed, or the water.

EXERCISE.

During the spring season fowls having free range get abundant exercise. Close confinement without exercise is not conducive to the best results, although the feed provided may be the best, for idle hens soon grow too fat to lay. It is almost impossible to give laying hens which are confined too much exercise. The fowls may be encouraged to exercise by scattering grain in the litter. The litter should be from 3 to 6 inches deep, and may consist of straw (either cut or whole), hay, leaves, buckwheat hulls, shredded corn fodder, or any convenient material of this nature. The hens should be kept

hungry enough so that they will work diligently all day for the grain scattered in this litter, which should be removed whenever it becomes damp or soiled.

AGE OF BIRDS FOR PROFITABLE EGG PRODUCTION.

It is possible to have the right variety of fowls, to house and feed them properly, and yet not obtain eggs early in the winter because the fowls are too old. It seldom pays to keep hens for laying after they are two and a half years old—not that they will not give a profit but that younger fowls will give a greater profit. A great many poultrymen who make a specialty of winter egg production keep nothing but pullets, disposing of the one-year-old hens before it is time to put them into the winter quarters. Early hatched pullets, if properly grown, ought to begin laying in September or October and continue to lay throughout the winter. Yearling hens seldom begin laying much before the first of January and older hens not until later. It is the November and December eggs that bring the high prices. The laying breeds should begin laying when about six months old, general-purpose breeds at seven months, and the meat breeds at eight months.

RAISING CHICKENS.

To be successful in raising chickens it is necessary to have healthy and vigorous breeding stock, for the lack of vigor in the newly hatched chicks is often traceable to weak parents. Only the most vigorous and the best grown birds should be put into the breeding yards. Each bird should be full of life and energy and free from any serious deformity. Yearling hens are usually better than pullets for breeders, for the reason that the hens are more mature, do not lay so many eggs during the early winter, and consequently do not reduce their vitality so much before the breeding season. Vigorous hens from two to four years old can often be advantageously retained in the breeding yard. The male bird chosen should be young and active. An early hatched, well-developed cockerel is usually satisfactory, or a good, vigorous yearling or two-year-old cock may be chosen. The hens used for breeding purposes should be given plenty of green feed and the best care possible; they should be provided with large runs and should not be forced for heavy egg production during the early winter.

NUMBER OF FEMALES TO ONE MALE.

Of the light, active breeds, such as the Leghorns and Minorcas, 1 male will be sufficient for a pen of 12 to 15 females under ordinary conditions. In the case of the medium-sized fowls, such as the

Plymouth Rocks and Wyandottes, 1 male should be provided for every 10 or 12 females. With the heaviest breeds, like the Brahmas and Cochins, 1 male should not be mated with more than 10 females. Where 20 or 30 females are kept in one flock, keep 2 male birds, allowing one of them to run with the hens one day and the other the next day, having a coop or extra pen in which to keep the one not with the hens.

HATCHING CHICKS.

There are two methods of hatching and brooding chicks—the natural, in which the chicks are hatched and brooded by hens, and the artificial, in which they are hatched in incubators and brooded in houses or in separate outdoor brooders. For a small flock the natural method will be found the easier and less expensive. For a hundred or more hens and the raising of large numbers of chicks, and for the nonsitting varieties, the artificial method is the more practicable. There is also the added advantage with the latter method of being able to hatch chickens at any time of the year.

Eggs for hatching.—The eggs intended to be incubated should be kept at a rather cool temperature, 50° to 60° F. It is not advisable to keep them longer than two weeks before being incubated, and the fresher they are when set the better the chances of a good hatch and strong chicks. Only well-formed eggs with good, strong shells should be set.

The number of eggs to the hen depends on the season, the size of the hen, and the size of the eggs. The usual number for an average-sized hen in the spring is 13. The same hen set in winter should not be given more than 11. After the middle of May she can take care of 15. It is better to give less than she can cover than to give more, for when too many are given most of the eggs, if not all, will be chilled at some period of incubation.

Testing the eggs.—Each sitting should be tested for the removal of the infertile eggs, which gives a better chance to those left. If there are many infertile ones, and several hens have been set on the same day, some of the hens may be reset. The eggs should be tested about the sixth or seventh day.

Egg testers are sold by incubator manufacturers and by dealers in poultry supplies, or a homemade tester can be made in a few minutes from a small pasteboard or wooden box of such size and dimensions that a common hand lamp, a lantern, or a candle can be placed in it. A hole should be cut in the top directly over the flame and another a little smaller than an ordinary-sized hen's egg in one side opposite the flame. The testing should be done in a dark room. If the pen in which the hens are set can not be made dark enough, it is best to test after dark.

In testing, the light shining through the egg, held against the hole in the side of the box, shows the condition of the egg. An infertile egg is clear, while the fertile egg will show a spiderlike formation, a center with long, crooked threads, leading outward, and this formation will float as the egg is turned. The infertile eggs may be removed and used for cooking.

HATCHING CHICKS WITH HENS.

The quarters for sitting hens should be comfortable and convenient. The hen should be free from disturbance and should be provided with a yard or run. A good nest for medium-sized hens is a box 12 by 14 inches and 12 or 14 inches high. For large hens the nest should be 16 by 16 by 16. At the bottom of the front of the box there should be a strip from 4 to 6 inches wide, according to the height of the box. Barrels, half barrels, and boxes of various kinds may be used. Hay, straw, or excelsior makes good nesting material, and this as well as the hen should be dusted with a good insect powder. When a hen is not to sit in the nest in which she has been laying, it is best that she be moved after dark, for the majority of hens will then settle down more quietly in their new quarters than if moved during the day.

Feeding sitting hens.—Sitting hens should be well fed. Grain should be left where they can get it whenever they desire to come off the nest. Their feed should consist mostly of a variety of whole grain, such as corn, wheat, and oats. The feed a sitting hen requires is that needed for her bodily maintenance. Very little vegetable or meat should be given, for too much vegetable feed tends to loosen the bowels, and too much meat feed tends to stimulate a desire to quit sitting and begin laying.

Taking chicks from nest.—Chicks should be removed from the nest about 24 hours after the first chicks are hatched. By the time the first chicks are a day old they want to get out from under the hen and move about, which is liable to make the hen restless and often causes her to leave the nest.

Number of chicks to a hen.—If the weather is cold, 10 to 12 chicks are enough for one hen. As the weather becomes warmer, a few more may be given, but it is seldom advisable to give more than 15. The best place for the young chickens is an orchard which furnishes an abundance of shade and also admits plenty of sunlight.

Coops for hens and chickens.—The simplest coop is the common A-shaped coop. It is quickly and easily made. This coop may be made either with or without a floor. A floor is desirable, except during warm weather and where the soil drains quickly.

Another good coop is the box coop (fig. 9), which in some respects is preferable to the A-shaped coop, for in the latter the hen can stand

upright only near the middle of the coop, while with the box coop the entire floor space is available for her and the chickens. The box coop is also more easily cleaned. If desired a small covered run can be made for each coop. This is especially desirable if there is danger of losses from cats, hawks, etc.

INCUBATORS AND BROODERS.

Incubators.—There are several good incubators on the market, any one of which, if properly handled, will be found satisfactory. More depends on the operator in most cases than on the incubator. In buying an incubator, the order should be placed early without waiting

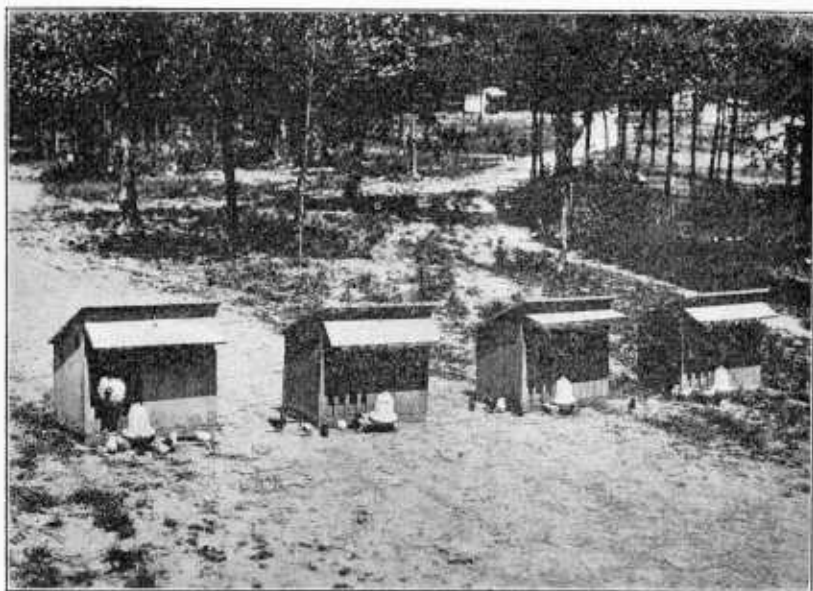


FIG. 9.—Coops for hen and chickens.

until the purchaser wishes to begin operating it. Spring is a busy time for the incubator companies, and it is often impossible for them, no matter how well equipped they may be, to fill orders the day they are received. Again, shipments are often delayed by the transportation companies. It is also advisable for every beginner to have his machine some time before he desires to fill it with eggs, in order that he may become fully acquainted with its operation. A book of instructions accompanies every incubator, which makes it unnecessary to go into details here. Probably the most common cause of failure with incubators is carelessness and neglect in attending to the machines.

Brooders.—The successful growing of chicks in brooders is much more difficult than the successful hatching of eggs in the incubator, because the artificial brooding of chicks is more foreign to nature.

In large poultry establishments brooder houses are an important part of the equipment. When the business is less extensive either indoor brooders in a small house or stove brooders in colony houses are used. Brooders may be purchased from the manufacturers or through poultry-supply firms. Manufacturers usually overrate the capacity of the brooders, for while a 100-chick brooder may be large enough for 100 chicks when first hatched, it will not be large enough for that number after they are a few days old.

The chicks are usually left in the incubator until they are 24 to 36 hours old, when they are placed in the brooder, which should have a temperature of 90° to 100° F. This temperature should be gradually reduced until a temperature of about 70° F. is reached, when the chicks are about 4 or 5 weeks old. However, the temperature after the first day or two should be governed largely by the action of the chicks and not by the thermometer. Crowding of the chicks to the outside of the brooder, panting or breathing hard, indicates too much heat; on the other hand, crowding and huddling about the heater indicate the need of more heat. Where they spread out comfortably at night part way between the heater and brooder walls, or just inside the fringe, where a hover is used, it is a safe indication of the right amount of heat. Chicks must be kept warm while at rest, and should always have a warm place ready for them to run to when they feel chilly. They should not be allowed to huddle together outside the brooder, but should be placed inside until they learn to go there of their own accord.

The natural method of applying warmth to chicks is to their backs, and it is a generally accepted fact that in artificial brooding the heat should be supplied from overhead with a very moderate warmth from the floor. Experience has generally shown much bottom heat to be conducive to weak legs.

Pure, fresh air is as essential as heat. The most common way of supplying this air is in connection with the heating system, with a constant circulation of warm air coming in around the heater.

Cleanliness is essential, and brooders should be cleaned and aired every day, if possible, and the floor sprinkled with sand or similar material to absorb the droppings. The water fountains or dishes and the troughs used for soft feed should be kept perfectly clean.

Incubator chicks at first are generally free from lice, but during warm weather lice are apt to find their way to the brooder, and it is well to keep a sharp lookout for them.

The chicks should be allowed to use the brooder until they are from 6 to 10 weeks of age (depending largely on weather conditions and the development of the chicks), when they may be removed to colony houses or to coops.

FEEDING AND CARE OF CHICKS.

The first rule for getting a good profit from poultry is to get the chicks hatched early, and the next is to keep those chicks growing so that they will reach laying maturity before the commencement of cold weather. There is no profit in keeping a chicken just alive, whether it is intended for laying stock or for the market. One reason why more care should be exercised in feeding chicks than in feeding fowls is that the former know less than the latter as to what is good for them. The healthy chick is a hungry thing and will eat what is given it, and, the digestive organs being weak, are less able to dispose of objectionable feed than are those of older fowls.

The first feed.—The chicks should not be fed until they are 36 hours old. Nature has provided for this by the absorption of the egg yolk into the chick's abdomen just previous to hatching. It is essential that this feed should be digested and assimilated before any other is given to them. Many persons are in a hurry to start the chicks growing, and hurry feed into their crops before the system is ready to take care of it. This results in bowel trouble and very often in the death of the chick. For the first meal a hard-boiled egg, chopped fine, shell and all, mixed with three times its amount of stale bread crumbs, is good. In fact, boiled eggs mashed and mixed with three or four times their bulk of stale bread or cracker crumbs are excellent for pushing the young chicks along for the first week or two. However, hard-boiled eggs are concentrated feed, and if fed long and in much quantity are likely to cause bowel trouble. Stale bread soaked in whole milk or skim milk is also very good for feeding young chicks. After soaking, the milk should be squeezed out until the mass crumbles readily.

Beginning use of grain feed.—When the chicks are a few days old it is well to begin to feed a little grain. Millet seed, finely cracked corn and wheat, "pinhead" oatmeal, and broken rice may be scattered in the litter or short grass about the coop or brooder. It will pay to sift the cracked corn and wheat through sieves, so as to remove both the meal and the larger pieces. A very good mixture of cracked grains for chicks is 2 parts wheat, 2 parts "pinhead" oatmeal, 1 part corn, 1 part rice, and 1 part millet seed. Another good mixture is 4 pounds cracked wheat, 4 pounds cracked corn, 2 pounds millet seed, 2 pounds cracked hulled oats or pinhead oatmeal, and 1 pound fine beef scraps. There are also many prepared chick feeds on the market which are very good.

Frequency of feeding.—Young chicks should be fed little and often. They should be fed early in the morning and just before night, and not less than three times in the intervening period. For the first two weeks they may be fed three meals of soft feed and two of hard,

and after that age two of soft and three of hard, feeding less soft feed as they grow older. No more moistened soft feed should be given at one time than they will eat up clean. If any is left it should be removed, nothing causing more bowel looseness and dysentery among young chicks than sour feed. The finely cracked grains may be safely used from the start, but the chicks do not as a rule grow so rapidly as when a part of the feed is ground. When the chicks are from 4 to 6 weeks old the frequency of feeding need be only four times a day.

Green feed.—Green feed must be supplied in some form. If the chicks are cooped on young grass they will help themselves, but if confined in small yards green feed should be given them. Some

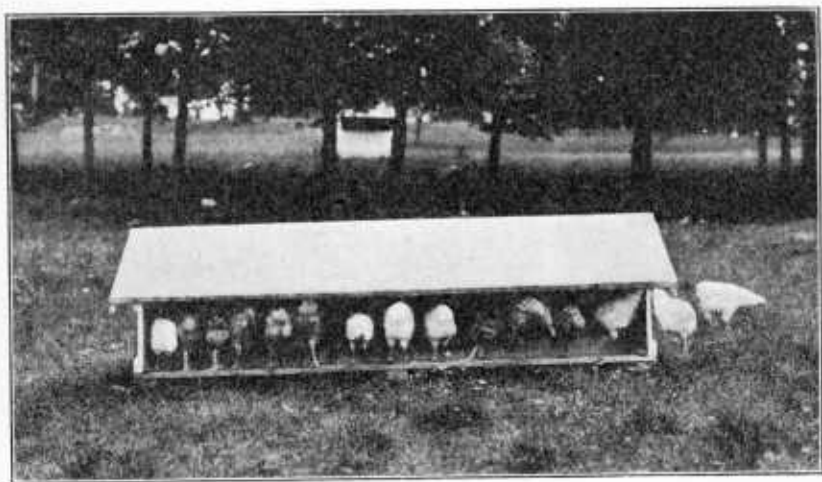


FIG. 10.—Feed hopper, for outdoor use, for growing chicks.

tender and easily broken green stuff which is easily assimilated should be furnished, such as finely cut grass from the lawns, lettuce leaves, onion tops chopped fine, or boiled vegetables.

Animal feed.—When on free range the chicks pick up insects and worms. These are most abundant during the spring and summer, and it is at this time that the chickens thrive. When they can not get these abundantly animal feed must be furnished in some other form. For the youngest chicks the hard-boiled eggs are sufficient, and as the chicks grow older beef scraps and green cut bone may be fed.

Milk.—Young chickens are fond of milk. It is highly nutritious, promotes growth, and may take the place of other animal feed to some extent. Skim milk is excellent; if whole milk is fed it is well to dilute it with one-third to one-half of water.

Grit.—Grit is another necessity. A dish of chick-size grit should be always before them, that they may help themselves.

Water.—Fresh, cool water should be constantly accessible, so that a drink can be taken whenever wanted. Many cases of cramps are caused by letting the chicks become thirsty and then fill up on water.

Charcoal.—Many successful poultrymen keep charcoal before the chicks, while others equally successful never use it. Considering the number of successful growers who use no charcoal, it can not be said that there is much need of keeping it always before chicks; but if they are not thrifty it is one of the simple things to supply before changing feed or beginning to give medicine.

Johnnycakes, etc.—Where only a few chicks are raised the feeding of johnnycakes is often practiced, but when so many chicks are kept that the baking of cakes becomes burdensome, mash is preferable. Add a little soda to sour milk and stir in corn meal to make a stiff batter. The addition of a few infertile eggs will improve the cake. Bake until well cooked through. Make the cake thick so as to reduce the proportion of crust.

Other cakes may be made as follows: One pint of corn meal, one-half pint bran, 1 teaspoonful meat meal, 1 raw egg, 1 teaspoonful soda, add milk to make stiff batter, and bake 2 hours.

Ten parts corn meal, 3 parts wheat middlings, 1 part meat meal, by measure; add baking soda; mix with water or skim milk and bake.

Exercise.—From the very first chicks should be induced to exercise, for activity is a prime factor in promoting health and growth. Feed grain in the litter and make them scratch for it. A little fine chaff or finely cut clover makes a good litter.

Teaching the chicks to roost.—It is often advisable to teach the chicks to roost when 8 to 12 weeks of age. When they are allowed to remain on the floor it is difficult to keep them clean and to keep them from crowding. If wide roosts—3 to 4 inches—are used, there is but little, if any, more danger of crooked breasts than if the chicks are allowed to remain on the floor. The chicks can generally be taught to roost by putting the perches near the floor and placing with them one or two old hens or older chicks that are in the habit of roosting. If this plan is inconvenient or does not prove effective, the chicks may be placed on the perches after dark for a few nights until they have learned to go there of their own accord.

Separating the sexes.—If convenient the sexes should be separated, for both the cockerels and the pullets will develop better. In the case of the more precocious breeds they should be separated when removed from the hen or brooder. The more slowly maturing varieties may be allowed to run together somewhat longer, but in any case the separation should be made before the cockerels begin to annoy the pullets.

FATTENING POULTRY.

The two most common methods of fattening poultry practiced in this country are pen fattening and crate fattening.

PEN FATTENING.

Pen fattening is practiced by a great many who do not have the time and inclination to use other methods. The essentials of pen fattening are quiet surroundings and plenty of soft feed given at regular intervals, usually three times a day. Birds may be kept in flocks of 15 or 20, but the sexes should be separated.

CRATE FATTENING.

In crate fattening a few chickens are confined in crates and fed from a trough. A crate 6 feet long, 18 inches high, and 18 or 20 inches wide is suitable and is large enough for a dozen birds. Sometimes such a crate is divided into two or three compartments, 4 to 6 birds being placed in each compartment. But little room for the birds to move about is desirable, for the less exercise a bird obtains the more readily it fattens. The top, back, and ends of the crates should be solid if they are to be placed outdoors, but if they are to be in a building they may be built of laths or slats. These slats should be 2 inches apart in front, so as to permit the birds to eat from the troughs, which are hung just outside the coop. The slats of the bottom of the coop should be about 1 inch apart to permit the droppings to fall through. The birds are usually fed three times a day, and are permitted to eat for half an hour at a time, when the uneaten feed is removed.

FEED FOR FATTENING.

Fattening birds should always receive soft feed. As they have no exercise they require a feed that can be quickly and easily digested. The following mixture may be fed: 100 pounds finely ground barley, 100 pounds finely ground corn, 100 pounds finely ground oats (with hulls sifted out), to which mixture is added 10 per cent of beef scraps. Buttermilk or skim milk is used for mixing, the former being preferred. A little salt is sometimes added, which should be dissolved in the liquid before mixing this with the dry feed. The birds are fed either two or three times a day. It is important that the intervals between the feedings should be as nearly equal as possible.

Another ration may be made as follows: 100 pounds ground oats, 100 pounds ground corn, 50 pounds flour.

MARKETING POULTRY AND POULTRY PRODUCTS.

A large part of the profit in poultry keeping often depends on the marketing of the products, and the producer should study the market demands as to how, where, and when to dispose of the products to the best advantage. An attractive appearance is of prime importance, and it is well to study the details of killing, dressing, and packing in order to arrange the products in the best possible manner. The requirements for dressing and packing vary somewhat in different markets, and the producer should learn any special requirements of the market to which he intends shipping.

KILLING, DRESSING, AND PACKING POULTRY.

Killing.—The birds should be kept without feed from 18 to 24 hours before killing, unless they are to be drawn, in which case they should have no feed for at least 10 hours before killing. Water for drinking is supplied up to the time the birds are killed. When ready to kill, suspend the fowl by the legs and, using a knife, cut the vein at the back of the throat through the mouth. As soon as this vein is cut, run the point of the knife into the brain, either through the roof of the mouth or through the eye, which causes the bird to lose all sense of feeling. Instead of piercing the brain, the fowl can be paralyzed by a blow on the head.

Dry picking.—In most markets dry-picked birds are preferred. Immediately after killing, while the bird is still bleeding, the picker should remove the feathers, being careful not to tear the skin. If the picker waits until the bird is partially cold the feathers will be removed with difficulty. As soon as picked the fowls should be hung in a cool place until thoroughly cold. If the weather is warm and fowls are to be packed in ice they should be placed in a tank of ice water and left until all the animal heat has left the body.

Scalding.—When birds are scalded before removing the feathers they are immersed in hot water, which should be a little below the boiling point, as soon as they are through bleeding. The birds should be immersed three or four times and then picked clean, care being taken not to break the skin. The fowl should next be "plumped" by dipping it in nearly boiling hot water for 8 or 10 seconds and then placing it in cold water, where it should remain for 15 or 20 minutes. Be careful not to overscald, as this will cause the outer surface of the skin to rub off. If the fowls are to be shipped dry they should be hung up until the skin becomes thoroughly dry. If they are to be packed in ice they may be left in the cold water for several hours or until they are to be packed.

Drawing.—When the poultry is to be drawn this should be done before the bird is cooled. A slit should be made from near the end

of the keel bone toward the vent, large enough to admit the fingers. Then cut carefully around the vent and pull out the intestines, leaving in everything else unless the market requirements are otherwise.

Packing.—When the birds have been thoroughly cooled they are ready for packing. Packages for dressed poultry vary greatly, but they should be neat and clean and small enough to be easily handled. The inside of the box or barrel should be lined with clean, unprinted paper. Pack the birds solidly so that they will not shift in the package, but be careful not to bruise them. For delivery to retail customers pasteboard boxes of sufficient size to hold one or two birds are very satisfactory. When poultry is to be packed in ice, barrels are generally used and are packed with alternate layers of birds and ice, the latter forming the top and bottom layers.

SHIPPING LIVE POULTRY.

Poultry of all kinds can be shipped alive and will often net the shipper as much as when dressed. Good, live fowls will usually bring more than the same fowls poorly dressed. For shipping live poultry to market well-constructed slatted crates are desirable, as these crates provide for ventilation. This is important, for in crowded express cars the crates are frequently piled on top of one another. Overcrowding is to be avoided, and if large coops are used they should be equipped with partitions to prevent the birds from being thrown together at one end when the crate is tipped in handling. If possible place only one variety in a coop or in one division of a coop.

SORTING, PACKING, AND SHIPPING EGGS.

Eggs to be placed on the market should be carefully sorted and packed as to size, shape, and color. It is better not to put eggs having different-colored shells in the same package; neither should eggs varying much in size be placed in the same package. Every egg should be perfectly clean, and if slightly soiled it may be wiped clean with a damp cloth. If badly soiled, the eggs should be discarded, for the washing required to clean them injures their appearance. The discarded eggs can be disposed of at some of the cheaper and less exacting markets. Eggs may be placed in large shipping cases or in small pasteboard boxes, according to how they are to be marketed.

TESTING EGGS.

When supplying a fancy trade with eggs, or on receiving eggs from outside sources, it is often desirable to determine their freshness. The method generally used by commission merchants for this purpose is known as candling, and consists in holding the egg between the eye and a light so as to note the contents. This should

be done in a darkened room, using one of the egg testers on the market or the simple homemade tester described on page 22 under the heading "Testing the Eggs." The air space in a perfectly fresh egg is very small, and as the egg loses part of its contents by evaporation this air space increases in size with the age of the egg. Fresh eggs should appear clear and bright, showing no dark spots.

METHODS OF SELLING.

There are three general ways in which poultry products may be marketed: First, direct to the consumer; second, direct to the retailer, and, third, to commission merchants to sell on the open market.

Selling direct to the consumer.—Selling direct to the consumer is generally considered the most profitable method of disposing of high-grade goods, for the charges of middlemen are eliminated. The producer is often so situated that he can build up a retail trade among the families of a neighboring city or village, delivering his goods direct to the customer once or twice a week, or oftener if desirable. In this way he can usually obtain a substantial increase over prices paid in the open market. This is especially true in the case of strictly fresh eggs. It is also often possible to obtain customers in a city that is within reasonable shipping distance, expressing to them a stated quantity of eggs and dressed poultry at regular intervals (once or twice a week). Hotels, restaurants, and clubs are good customers and can be supplied in this way by contract.

Marketing eggs by parcel post.—Where the distances are not too great many eggs are shipped by parcel post, to the advantage of both the producer and the consumer. It is usually more economical to ship in two or three dozen lots, for the postage per dozen is less than for dozen-lot parcels.

Selling direct to the retailer.—There are often many grocery and provision dealers who cater to a select trade, to whom the producer can sell regular supplies of fresh eggs and poultry.

Selling to commission merchants.—The simplest method of disposing of the produce is to sell it to commission merchants, as it does away with the expense and trouble involved in a private trade, but the returns are usually not so great, except when dealing with certain commission houses that have built up a fine trade along certain lines.

Which of the above-mentioned methods will pay best is a question for the producer to decide for himself. It is largely a question of market conditions, personal circumstances, and the kind of business done, whether large or small.

PRESERVING EGGS.

The following methods have proved sufficiently satisfactory to warrant the preservation of eggs for home use:

Eggs to be stored should be: (1) From hens that have no males running with them, because an infertile egg keeps longer, even without the use of a preservative, than a fertile egg; (2) perfectly fresh, for not only will they keep much better, but if an egg which has begun to decay is placed in the same vessel with fresh ones it is likely to affect all the surrounding eggs (fertile eggs which are strictly fresh will keep satisfactorily); and (3) perfectly clean, for filth of any kind adhering to the shell will taint the preserving medium and thus taint the other eggs.

In placing eggs in the preservative be careful not to crack the shells. Keep them in a moderately cool room where the temperature may be fairly constant. A dry, clean cellar is a suitable place.

Water glass.—Of the many methods which have been tried for preserving eggs on a small scale none have proved more successful than the use of water glass (sodium silicate). This product can usually be procured at about \$1 a gallon, and 1 gallon will make solution enough to preserve 50 dozen eggs, so that the cost of material does not exceed 1 cent a dozen. Pure water that has been boiled and then cooled should be used. To each 10 quarts of water 1 quart of water glass should be added. The solution should be prepared, placed in a jar or other suitable vessel, and the fresh eggs added from time to time until the jar is filled; but be sure that there is 2 inches of the solution covering the eggs. The eggs should not be washed before packing, for washing injures the keeping quality, probably by dissolving the mucilaginous coating.

Limewater.—A good limewater preservative may be made as follows: Dissolve 2, or 3 pounds of unslaked lime in 5 gallons of water that has previously been boiled and allowed to cool, and allow the mixture to stand until the lime settles and the liquid is clear. Pour or dip the clear liquid into an earthenware jar or other suitable receptacle and put the eggs in, or the eggs may be placed in the vessel first and the limewater poured over them. Have about 2 inches above the eggs. Limed eggs can be discerned by the roughness of the shell.

Before boiling eggs which have been preserved in the foregoing ways, the shells should be punctured with a needle; otherwise they are apt to crack as soon as placed in hot water, owing to the pores being closed.

Cold storage.—Cold storage is undoubtedly the best and most practicable method for preserving eggs in large quantities in a com-

mercial way. As the processes by which a low temperature can be maintained for an indefinite period have become more and more improved the greater has been the number of eggs so stored, until the cold-storage business has reached such proportions that it has a considerable influence on the price of eggs, tending to lower it in winter and raise it in summer. Cold storage, however, is not usually available or practicable for preserving eggs in a small way for home use.

DISEASES, BAD HABITS, AND INSECT PESTS.

Prevention is better than cure, so it will be well to consider in general some of the more frequent causes of disease. Filth, dampness, improper ventilation, improper feeding, and the introduction of infected birds into the yard may be mentioned as some of the most common causes.

IMPORTANCE OF CLEANLINESS.

Everything about a poultry house should be kept reasonably clean. As a rule droppings should be removed daily, for the accumulation of excrement harbors parasites, contaminates the air, and breeds contagion. After the dropping boards have been cleaned they should be sprinkled with road dust, coal ashes, land plaster, or air-slaked lime to absorb the liquid excrement. Nests in which straw or other similar material is used should be cleaned out and new straw put in about once every 3 or 4 weeks, or oftener if it becomes damp or dirty.

The quarters should be thoroughly whitewashed at least once a year, late in summer or early in the fall. The whitewash can be made by slaking lime in boiling water and then thinning to the proper consistence for applying. The addition of 4 ounces of carbolic acid to each gallon of whitewash will increase its disinfecting power. The runs should be plowed occasionally so as to bury the accumulated droppings and to turn up fresh soil.

DISEASES.

When a disease has become firmly established in a flock or a single bird is badly affected the free use of the hatchet is usually the most practicable method, as it does not pay to spend two dollars' worth of time in curing a one-dollar bird. Slight cases, however, can often be cured with but little trouble. In nearly every instance it is better to remove the well fowls and put them by themselves; and in the case of infectious disease the premises should be thoroughly disinfected.

Roup, or contagious catarrh is a very contagious disease affecting the eyes, nose, and throat. The first symptoms are a thin, watery discharge from the nostrils, watery eyes, and swollen eyelids. As the disease advances the discharge from the nostrils becomes thick, the

swelling of the eyelids increases, the spaces or sacs beneath the eyes become filled with a secretion causing a large, painful swelling, and the eyelids often become glued together by the accumulated secretion.

The sick birds should be removed from the flock and put into dry quarters which are well ventilated but free from drafts. Wash carefully the eyes and mouth with warm water to which a little salt has been added (about 1 teaspoonful to a quart of water). In washing the eyes a soft cloth or a piece of absorbent cotton may be used. After being cleansed the affected parts should be washed with one of the following solutions: One ounce of boric acid in a quart of water, 1 dram of permanganate of potash in a pint of water, or 1 ounce of peroxide of hydrogen in 3 ounces of water. Instead of washing with one of the above-mentioned solutions the bird's head may be dipped into a bowl of one of the solutions, holding the head under for a few seconds but not long enough to cause suffocation. After treating the birds in this manner, grease the heads with vaseline. The treatment of sick birds is a laborious undertaking and in severe cases it is best to kill the bird at once.

Chicken pox (sometimes called sorehead) is a contagious disease which is more prevalent in warm than in cold climates. It is characterized by an eruption of nodules on the comb, wattles, and ear lobes. As soon as the disease makes its appearance the houses, coops, drinking vessels, and feed troughs should be disinfected. Apply carbolated vaseline to the affected parts. This treatment after a short time will cause the crusts on the nodules to drop off; then the tissue or sore underneath should be painted with tincture of iodine or a 5 per cent solution of carbolic acid.

Diarrhea is caused by some irritation of the digestive system, and may be due to the quantity of the feed, the quality of the feed or drinking water, or to climatic conditions to which the fowl has been exposed. There is a general depression, roughness of plumage, loss of appetite, and usually frequent expulsion of soft, whitish, yellowish, or greenish excrement, the droppings becoming more liquid until severe diarrhea is present. When the affection is at all serious the excrement may become mixed with mucus or blood. It is important that the cause be sought out and removed. See that the birds have comfortable quarters and that they are not exposed to drafts, cold, or dampness. If taken early, diarrhea can often be checked by reducing the amount of green and animal feed and feeding largely on dry feed, eliminating the moist mash. Give a tablespoonful of sweet (olive) oil as a laxative to carry off any irritating matters that may be in the intestine.

Gapes is caused by the presence of small worms which are attached to the lining of the trachea or windpipe, where they cause much

irritation and often death to young chickens. Gapes usually occurs when the chicks are from 2 to 6 weeks old. Separate the well from the sick birds and clean the coops, pens, and feed and water dishes by disinfecting with a 5 per cent solution of carbolic acid. Sometimes the worms can be removed from the trachea by inserting a feather moistened with turpentine or kerosene. The oil will cause the dislodgment of the worms, and some will be drawn out with the feather, while others will be expelled by coughing or sneezing. Place the chicks on a piece of paper so that the worms may be caught and burned.

Freezing (frostbite).—If the combs or wattles of fowls become frozen, and it is discovered before they thaw out, apply snow or cold water to remove the frost, for this gradual thawing will often save them. Then apply vaseline to the affected parts twice a day.

Scaly leg is caused by a mite which burrows under the scales of the feet and shanks. It is contagious but does not spread rapidly. It is noticed most frequently in old fowls. The scales can be removed by soaking the feet and shanks in warm, soapy water and by rubbing or brushing them off with a toothbrush or nailbrush. After the scales have been removed apply sulphur ointment or equal parts of melted lard and kerosene. The frequent application of kerosene has also been found effectual without the previous soaking in water.

Crop bound.—The crop sometimes becomes overloaded with feed, and its thin muscular walls become distended and partially paralyzed, so that the organ can not be emptied. The crop is greatly distended and the mass of feed is rather hard and firm. For treatment pour one-fourth to one-half ounce of melted lard or sweet oil down the throat and manipulate the contents of the crop with the hand in such a way as to tend to break up the mass. The contents of the crop will usually pass away within a few hours. For a few days feed should be limited in quantity.

If the foregoing method is ineffectual and an operation becomes necessary, clip away the feathers from a portion of the crop, and with a very sharp knife, lancet, or razor make an incision about $1\frac{1}{2}$ inches long through the skin and the wall of the crop. Then carefully remove the contents of the crop with the finger, the handle of a spoon, or some other convenient object, and wash out the crop with warm water. Pass the finger, well oiled, into the esophagus to see that there is no obstruction. Sew up the wall of the crop first and then the outer skin, using white silk or linen thread, being careful not to sew the two membranes together, and in a few days the wound should be healed. Feed sparingly on whole grains until the wound heals, and do not give any water for 24 hours.

BAD HABITS.

Egg eating.—The egg-eating habit sometimes becomes a serious vice, fowls becoming very fond of eggs when they have learned to eat them; and it often spreads from fowl to fowl. It usually begins through accident by eggs being broken or frozen. Be careful to see that this does not happen. See that the nests are properly supplied with straw or other nesting material and have them darkened, so that if an egg is accidentally broken the fowls will not be so likely to discover it. Supply plenty of lime in the form of oyster shells, bone, or similar substances to insure a firm shell. As soon as it is discovered that a fowl has formed the habit the fowl should be removed, in order to prevent the spread of the vice. Once formed, it is difficult to eradicate, and the best remedy is the death penalty.

Feather eating.—Fowls sometimes pluck feathers from themselves and from one another, a habit often caused by too close confinement, by the presence of insect pests, or by improper feeding. When some of the fowls of a flock have formed the habit slightly, a wide range with a change of diet, including a plentiful supply of animal feed, and freedom from insect pests, will usually correct the evil. Above all, see that the fowls have plenty of inducement to exercise. If the habit becomes fixed, it is very troublesome and may necessitate the killing of the fowls in order to stop it.

INSECT PESTS.

Two classes of external parasites, popularly known as lice and mites, will be considered here. There are several varieties of lice which attack poultry. They subsist mainly on portions of the feathers and on scabs from the skin. They are found largely on the head and neck, under the wings, and about the vent, and when present in large numbers they cause considerable injury.

Commercial sodium fluoride has proved very effective in ridding birds of lice. A small pinch of the powder should be placed among the feathers, next to the skin, on the head, another pinch on the neck, two on the back, one on the breast, one below the vent, one on the tail, one on each thigh, and one scattered on the underside of each wing when spread. Mercurial ointment has also been used with success.

The mites subsist on the blood of the fowls and are not usually found on the bodies of the bird except when at roost or on the nest. During the day they hide in cracks and crevices of the walls, roosts, and nests. Sitting hens are often so annoyed that they are compelled to leave the nests in order to relieve themselves of these parasites. The free use of kerosene about the nests and perches is useful

in fighting mites. The walls of the house may be sprayed with kerosene, the operation being repeated two or three times at intervals of a week or ten days. Care should be taken to get the kerosene into all the cracks and crevices where the mites stay.

Commercial carbolineum, put on with a paint brush, has proved very effective. The killing power of this substance lasts for several months and therefore does not require so frequent applications as kerosene.

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